

INTERFACING ELECTRONIC FOR MEASUREMENT, SIGNAL PROCESSING AND WIRELESS COMMUNICATION



Edited by

Sheroz Khan, International Islamic University Malaysia

AHM Zahirul Alam, International Islamic University Malaysia

Anis Nurashikin Nordin, International Islamic University Malaysia



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

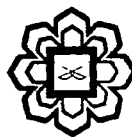
INTERFACING ELECTRONIC FOR MEASUREMENT, SIGNAL PROCESSING AND WIRELESS COMMUNICATION

Edited by

Sheroz Khan, International Islamic University Malaysia

AHM Zahirul Alam, International Islamic University Malaysia

Anis Nurashikin Nordin, International Islamic University Malaysia



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Sheroz Khan, AHM Zahirul Alam & Anis Nurashikin Nordin: Interfacing Electronic for Measurement, Signal Processing and Wireless Communication.

ISBN: 978-967-418-171-0

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed By:
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

CONTENTS

Chapter	Title	Page
1	INDUCTIVE SENSOR Atika Arshad, RumanaTasnim, Sheroz Khan, AHM Zahirul Alam	1
2	WIRELESS TRANSFER OF LOW-POWER TO IMPLANTED BIOMEDICAL DEVICES: INTRODUCTION AND 2-D COIL PARAMETERS Imran M. Khan, Sheroz Khan, Othman O. Khalifa	8
3	WIRELESS TRANSFER OF POWER TO LOW-POWER IMPLANTED BIOMEDICAL DEVICES: 3-DIMENSIONAL COIL DESIGN CONSIDERATIONS Imran M. Khan, Sheroz Khan, Othman O. Khalifa	14
4	WIRELESS TRANSFER OF LOW-POWER TO IMPLANTED BIOMEDICAL DEVICES: INDUCTIVE LINK DESIGN Imran M. Khan, Aminullah Khan, Sheroz Khan, Othman O. Khalifa	22
5	WIRELESS TRANSFER OF LOW-POWER TO IMPLANTED BIOMEDICAL DEVICES: RECTIFIER DESIGN Imran M. Khan, Sheroz Khan, Othman O. Khalifa	28
6	DATA CONVERSION BASIC CONCEPTS Ma Li Ya, Sheroz Khan, Anis Nurashikin	36
7	NYQUIST-RATE ANALOG-TO-DIGITAL CONVERTER Ma Li Ya, Sheroz Khan, Anis Nurashikin	41
8	OVERSAMPLING ANALOG-TO-DIGITAL CONVERTER Ma Li Ya, Sheroz Khan, Anis Nurashikin	47
9	SWITCHED-CAPACITOR INTEGRATOR DESIGN Ma Li Ya, Sheroz Khan, Anis Nurashikin	53
10	CMOS OPERATIONAL AMPLIFIER DESIGN Ma Li Ya, Sheroz Khan, Anis Nurashikin	60

11	DIGITAL-TO-ANALOG CONVERTER	68
	Ma Li Ya, Sheroz Khan, Anis Nurashikin	
12	CONVETERS RESULTS VERIFICATIONS	73
	Ma Li Ya, Sheroz Khan, Anis Nurashikin	
13	DEVELOPMENT OF WEARABLE REFLECTANCE PULSE OXIMETRY FOR TELEHEALTH MONITORING SYSTEM	77
	Muhammad Arham, Syed Zulfaenzi, Othman O. Khalifa	
14	DESIGN OF CAPACITIVE MEASURING SYSTEM FOR HIGH FREQUENCY BAND TRANSDUCER	83
	Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	
15	PRINCIPLE OF CAPACITANCE TO VOLTAGE CONVERTER	89
	Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	
16	CMOS OPERATIONAL AMPLIFIER TESTING FOR CAPACITIVE TO VOLTAGE CONVERTER	95
	Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	
17	MATHEMATICAL MODEL FOR CONTACTLESS MEASUREMENT	102
	Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	
18	FREQUENCY RESPONSE OF A CONTACTLESS MEASUREMENT	107
	Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	
19	A MATHEMATICAL STUDY OF A THERMISTOR ASTABLE MULTIVIBRATOR IN A LINEARIZATION TECHNIQUE	113
	Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	

20	A STUDY OF LINEARIZATION TECHNIQUE USING A NONLINEAR THERMISTOR	117
	Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	
21	COGNITIVE RADIO VS INTELLIGENT ANTENNA	123
	Siti Rabani Mat Nawi, Nurul Farhah Toha, Khaizuran Abdullah, M. Rafiqul Islam, Sheroz Khan	
22	UWB PULSE GENERATION AND MODULATION CIRCUITS FOR BIOMEDICAL IMPLANTS	134
	Mokhaled M., Mohammed, Sheroz Khan, Jalel Chebil, Khaled A. S. Al-Khateeb, Imran Moez Khan	
23	UWB COMMUNICATIONS FOR BIOMEDICAL IMPLANTS	141
	Mokhaled M. Mohammed, Sheroz Khan, Jalel Chebil, Khalid A. S. Al-Khateeb, Imran Moez Khan	
24	UWB PULSE GENERATION FOR BIOMEDICAL IMPLANTS	145
	Mokhaled M., Mohammed, Sheroz Khan, Jalel Chebil, Khaled A. S. Al-Khateeb, Imran Moez Khan	
25	ULTRA-WIDE BAND TECHNOLOGY	149
	Mokhaled M., Mohammed, Sheroz Khan, Jalel Chebil, Khaled A. S. Al-Khateeb, Imran Moez Khan	
26	MVL ADC DESIGN AND SIMULATION	153
	Soheli Farhana, AHM Zahirul Alam, Sheroz Khan	
27	MVL DESIGN AND CURRENT MODE CIRCUIT ELEMENTS	159
	Soheli Farhana, AHM Zahirul Alam, Sheroz Khan	
28	NOISE MODULATED CRYPTOGRAPHIC GENERATION FOR USE IN UWB WIRELESS COMMUNICATION	164
	Siti HazwaniYaacob, Sigit Puspito Wigati Jarot, Sheroz Khan	
29	UWB PULSE GENERATION AND SHAPING: ANALYSIS AND SIMULATION RESULTS	173
	Zeeshan Shahid, Sheroz Khan, AHM Zahirul Alam	

30	SIMULATIONS OF RESISTANCE VARIATIONS TO PULSE GENERATOR CIRCUITS	177
	Zeeshan Shahid, Sheroz Khan, AHM Zahirul Alam	
31	PULSE OXIMETRY DESIGN USING ARDUINO BOARD	184
	Muhammad Arham, Syed Zulfauzi and Othman O. Khalifa	

Chapter 12

CONVERTERS RESULTS VERIFICATIONS

MA LI YA, SHEROZ KHAN, ANIS NURASHIKIN

Once the converters (ADCs or DACs) have been developed, we need to verify and test the circuit function as well as the properties. In this chapter, different techniques to analyze the results from the converters are introduced.

12.1. INTRODUCTION

Analog-to-digital converters and digital-to-analog converters are essential building blocks in modern electronic systems. They form the critical link between the input of conversion system and the output. The wide variety of digital signal processing (DSP) applications leads to the availability of a wide variety of converters of varying price, performance, and quality. For an ideal ADCs, the difference between the analog input voltage and the corresponding voltage of the nearest code center is the quantization error, as shown in Eq. (1) (Lundberg, 2002).

$$V_{IN} = V_{FS} \sum_{k=0}^{N-1} \frac{b_k}{2^{k+1}} + \varepsilon \quad (1)$$

Where, V_{FS} is the full scale voltage, b_k are the individual output bits, and ε is the quantization error. In the reality, since the existing of static imperfections (such as gain, offset, mismatching), parasitic capacitance, etc. the real converters are different from the ideal behavior. Therefore, the converters' testing and verifications become an essential stage in the end of any converter's design. For ADCs and DACs, they have their own different ways to verify the performance and properties of the designed system. In this chapter, several methods to test the converter systems are introduced.

12.2. ADC TESTING

For testing a designed ADC, at the schematic level, generally there are three ways; i) To calculate the digital output bits and compare it with the analog value. This method is fit for stair case or even ramp ADC. The small resolution (or conversion bit) can be calculated, but not reasonable for the high resolution conversion or oversampling conversions; ii) To convert the ADC output back to an analog signal using an ideal DAC and compare with each other in time domain. An ideal DAC is usually designed by using "vcvs" (voltage controlled voltage source) which is a two port network. The main problem of this method is that it needs to design another high resolution digital-to-analog converter. By the way, the final analog output will inherit the quantization error from DAC; and iii)